WE CLAIM:

1. Imaging process for generating a 3-dimension representation of a 3-dimension observation field, said process including at least the following steps:

(a) detecting radiations emitted by a plurality of voxels in the observation field, through a collimator having radiation transmitting areas which are non-uniformly distributed, said radiations being detected in a set of pixels forming a 2-dimension image of detection, thus determining a detected 2-dimension distribution H(I,J) of the radiations detected through the collimator, I and J being two indicia representing a position of each pixel where the radiations are detected,

(b) and determining an estimated 3-dimension distribution of the radiation emissions of the voxels in the observation field, which corresponds to said detected 2-dimension distribution H(I,J), where i, j and k are three indicia representing the position of each voxel, said estimated 3-dimension distribution of the radiation emissions constituting said 3-dimension representation of the observation field,

the estimated distribution of radiation emissions being estimated by an iterative process comprising successive iterations conducted successively for several groups of voxels of the observation field, starting from a provisional estimated distribution of the radiation emissions hes_0, and each n^{th} iteration includes the following sub-steps:

(b1) determining a calculated 2-dimension distribution of radiations in the pixels, corresponding to the provisional distribution of radiation emissions,

(b2) calculating an error function representative of differences between said calculated distribution and said detected distribution,

(b3) if said error function has a value which is comprised in a predetermined range (i.e., generally when said error function is less than a predetermined value), stopping the iterative process and deciding that $hes(i,j,k)=hes_{n-1}(i,j,k)$; and if said error function has a value which is not comprised in said predetermined range, determining a new provisional estimated distribution of radiation emissions so as to decrease the error function.

2. Imaging method according to claim 1, wherein in step (a), the collimator through which said radiations are detected, has a unique spatial pulse response for each voxel of the observation field.

3. Imaging method according to claim 1, wherein in step (a), the radiations are detected around a main axis and the collimator through which said radiations are detected, has an average transmittance, averaged on a circle of radius r around said main axis, which varies with said radius r.

4. Imaging method according to claim 3, wherein in step (a), the collimator through which said radiations are detected, has an average transmittance, averaged on a circle of radius r around said main axis, which sinusoidally with the square of the radius r.

5. Imaging method according to claim 3, wherein in step, the radiation transmitting areas of the collimator through which said radiations are detected, are evenly distributed on each circle of radius r around said main axis, comprised in the collimator.

6. Imaging method according to claim 1, wherein in step (b1), the calculated 2-dimension distribution of radiations in the pixels is calculated by the formula :

$$H'_{n-1}(I,J)=\sum_i\sum_j\sum_k R(i,j,k;I,J).hes_{n-1}(i,j,k),$$

where $R(i,j,k;I,J)$ is a predetermined spatial pulse response between each voxel of the observation field and

each pixel of the image of detection.

7. Imaging method according to claim 1, wherein in sub-step (b2), said error function is calculated according to the following formula :

$$E_{n-1}=\sum_{I}\sum_{J}(H(I,J)-H_{n-1}(I,J))^2 .$$

8. Imaging method according to claim 1, wherein in sub-step (b3), one determines the new provisional estimated distribution of radiation emissions by a gradient method.

9. Imaging method according to claim 1, wherein each group of voxels includes several non-contiguous voxels.

10. Imaging method according to claim 1, wherein in step (a), said detected 2-dimension distribution is representative of a number of radiations detected in each pixel in a certain bandwidth, and in step (b) said estimated 3-dimension distribution of the radiation emissions is representative of a number of radiations emitted by the voxels of the observation field in said bandwidth.

11. Imaging device specially designed to carry out the imaging method according to claim 1.